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Summary of Track 3: Particulate System and Bulk Solids Technology

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This track was organized by Professor Qicheng Sun from Tsinghua University and Professor Shunying Ji from Dalian University of Technology. The topics addressed included micro-macro characterization and relationships, and industrial and engineering applications. There were 3 keynote lectures, 36 oral speakers (including 2 invited speakers) and 14 posters in this relative small track.

Professor Benjamin Glasser, from Rutgers University, USA, reported his study on wet and dry granular flows. He summarized his works on the understanding of granular flow, mixing, segregation and scale-up in bladed mixers and rotating cylinders using both experiments and particle dynamics simulations, and the applications of these results to improving the operation of industrial processes. Professor Stefan Luding, from University of Twente, The Netherlands, reported his works in handling wide particle size distribution, particle breakage, agglomeration and other processes in discrete particle method, the coarse-grained particle method for modeling large scale problems and the transition from the discrete method to the continuum method, all of which have been implemented in an open-source software (www.mercurydpm.org). Finally, the dosing problem is studied in detail as an example to show the power of the MercuryDPM software. Professor Mao Ye, from Dalian Institute of Chemical Physics, Chinese Academy of Sciences, China, introduced a new DMTO process which has been implemented in coal-to-chemical plants in China, and then reported their experimental results on the attrition of DMTO catalyst at different gas-solid interaction regimes in fluidized bed and the corresponding attrition mechanism at different regimes.

In addition to the keynote lectures, the oral and poster presentations in the track also share some features: (i) Most of the attendees have engineering background, although granular flow is a very hot topic in physics; (ii) The importance of discrete element method in exploring the complex dynamics of particulate systems and their underlying mechanism has been well acknowledged; (iii) The effects of particle shape, particle size distribution or inter-particle cohesive force on the bulk behavior of particulate systems are frequently discussed.

In summary, substantial progress has been made in the study of particulate system and bulk solids technology, a closer collaboration between engineers and physicists might result in a rapid progress in solving complex engineering problems.

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